

REMARKS

Entry of the foregoing and reexamination and reconsideration of the subject application, as amended, pursuant to and consistent with 37 C.F.R. § 112, are respectfully requested in light of the following remarks.

Claims 1-24 are pending in this application.

Claim 4 has been amended to correct a typographical error in the spelling of the word polyfunctional. Claim 5 has been amended to correct a typographical error in the value of m. Support for this amendment is found on page 5, line 10 of the specification.

No new matter has been introduced as a result of the foregoing amendment.

Claim Objections

Claim 4 was objected to because the claim recited "polyfunctinoal" instead of "polyfunctional".

Claim 4 has been amended to correct the typographical error in the spelling of polyfunctional. Applicants request that this objection be withdrawn.

35 U.S.C. § 103 Rejection

Claims 1-24 have been rejected under 35 U.S.C. §103(a) as being unpatentable over Okada (US 2002/0051911).

Applicants respectfully submit that the claims are not obvious over Okada.

To establish a *prima facie* case of obviousness, three basic criteria must be met. (MPEP 2143) First, there must be some suggestion or motivation, either in the

references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations.

Okada relates to a curable composition for a polymer electrolyte which comprises the following constituents as an essential constituent: (A) a SiH group containing polysiloxane; (B) a compound having at least one structure selected from the group consisting of a phenylene unit, a siloxy linkage, an Si-N bond, a carbonyl group, an amide linkage and an amino group and having two or more alkenyl groups; (C) a hydrosilylation catalyst; and (D) an electrolyte salt compound. The entire description of constituent B is provided in paragraphs [0049]-[0055] of the Okada. As acknowledged by the Examiner, Okada does not disclose SiH groups on the compounds in constituent B. One of ordinary skill in the art would also recognize that while Okada describes a variety of compounds that can be used for crosslinking a polysiloxane POS(A), as defined in Okada, there is nothing in Okada that teaches or suggests that constituent B is a polyorganosiloxane. Many of the teachings in Okada suggest that constituent B is not a polyorganosiloxane. For example, Okada teaches:

[0052] From the strength and moldability viewpoint, it is preferred that the constituent (B) have a low molecular weight, specifically of not more than 500, more preferably not more than 400. When the molecular weight is high, the ionic conductivity tends to lower.

Okada also teaches that POS with low molecular weight PEO on side chains have insufficient ionic conductivity, poor workability and moldability and have insufficient mechanical strength:

[0006] Further, materials derived from polysiloxanes by introduction of low-molecular PEO onto side chains thereof are described in Journal of Power Source, 20, 327 (1987), Japanese Kokai Publication Sho-63-136409 and Japanese Kokai Publication Hei-02-265927. They are, however, insufficient in ionic conductivity, are not noncrystalline, are not easy to synthesize, occur as liquids and are poor in workability or moldability, and are insufficient in mechanical strength. For these and other reasons, they have not been put to practical use.

[0007] A hydrosilylated crosslinked compound derived from a PEO side chain- and SiH group-containing polysiloxane and an olefin having polyethylene oxide in its main chain is described in Japanese Kokai Publication Hei-03-115359. However, the ionic conductivity thereof is considerably low, namely about $4.9 \times 10^{-5} \text{ S.cm}^{-1}$, and this is not satisfactory.

Okada further teaches that constituent (B) should not have any polyethylene oxide structure, in particular any polyalkyleneoxide:

[0051] It is preferred that the constituent (B) is substantially free of any polyethylene oxide structure, in particular any polyalkyleneoxide. Since the constituent (B) is a constituent for crosslinking the constituent (A) polysiloxane, the occurrence of such structure in the constituent (B) tends to decrease the ionic conductivity.

Okada also teaches that the use of constituents (A) and (B) permits the composition to form a 3-D network structure that results in improvements in mechanical strength and workability/moldability:

[0072] The curable composition for polymer electrolyte according to the invention, when crosslinked by the hydrosilylation reaction, forms a three-dimensional network structure. Therefore, the tasks unachievable with the prior art polymer electrolytes, namely fluidity prevention and improvements

in mechanical strength and workability/moldability, can be accomplished in accordance with the present invention.

One of ordinary skill in the art, upon reading paragraphs [0052] and [0072], would recognize that the use of specific low molecular weight compounds as constituent B is needed to obtain the beneficial 3D network structure. Such a person would not be expected to consider using a high molecular weight compound such as a POS as this would affect the 3D network structure..

One of ordinary skill in the art, in attempting to modify Okada, would examine the disclosure of both the generic and specific compounds that may be used as constituent B. The generic disclosures of constituent B are found in paragraphs [0050] and [0053] and disclosure of specific compounds is found in paragraph [0054].

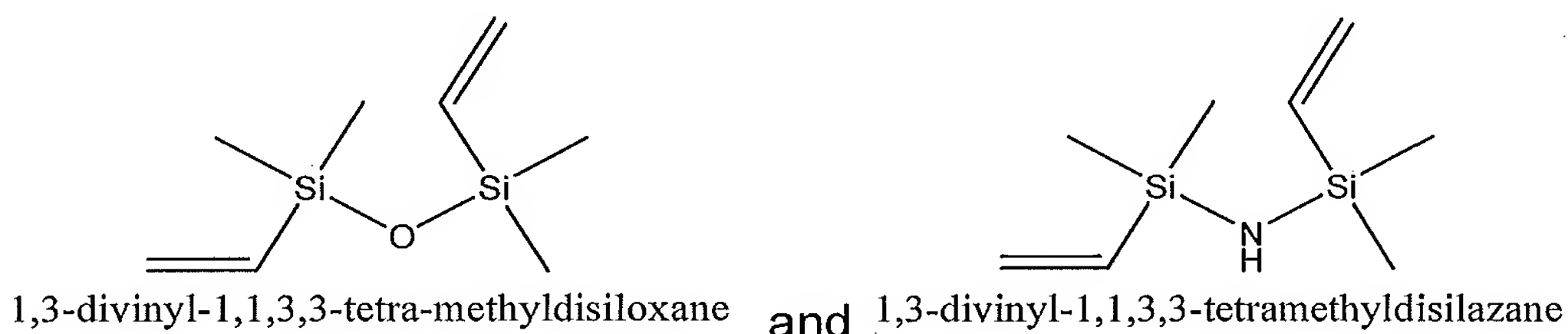
[0050] Any of those compounds known in the art which have at least one structure selected from the group consisting of a phenylene unit, a siloxy linkage, an Si-N bond, a carbonyl group, an amide linkage and an amino group and have two or more alkenyl groups can be used as the constituent (B), without any limitation. The constituent (B) preferably has a number average molecular weight M_n [GPC (polystyrene equivalent basis)] within the range of 80 to 1,000.

[0053] As preferred examples of the constituent (B), there may be mentioned compounds having a phenylene unit and two or more alkenyl groups, compounds having a siloxy linkage and two or more alkenyl groups, compounds having an Si-N bond and two or more alkenyl groups, compounds having a carbonyl group and two or more alkenyl groups, compounds having an amide linkage and two or more alkenyl groups, compounds having an amino group and two or more alkenyl groups and

compounds having a phenylene unit and a carbonyl group and two or more alkenyl groups.

[0054] Specifically, the constituent (B) includes bisphenol A diallyl ether, 2,2'-diallylbisphenol A, divinylbenzene, 1,3-divinyl-1,1,3,3-tetramethyldisiloxane, 1,3-divinyl-1,1,3,3-tetramethyldisilazane, diallyl maleate, diallyl succinate, diallyl carbonate, diallyl dicarbonate, allyl-terminated acrylic polymers, 1,3-diallylurea, diallylamine and diallyl phthalate.

One of ordinary skill in the art would recognize that the number of compounds encompassed by the generic disclosures would be extremely large, given the very broad description. Such a person, upon evaluating the nature of the compounds specifically disclosed, would recognize that, with the exception of allyl-terminated acrylic polymers, each of the other compounds have very simply structures. Only two of the compounds contain silicon:



Allyl-terminated acrylic polymers are the only complex/polymeric material specifically described. Based on this disclosure, one of ordinary skill in the art would not be expected to choose a polyorganosiloxane as constituent B.

The instant claims require a POS with at least one group directly bonded to a silicon atom comprising a polyoxyalkylene (Poa) ether functional group. As shown above, Okada teaches that constituent B is substantially free of any polyethylene oxide structure, in particular any polyalkyleneoxide, because the presence of the structure decreases the ionic conductivity.

[0051] One of ordinary skill in the art, upon reading Okada, would recognize that Okada teaches away from using a POS with at least one group directly bonded to a silicon atom comprising a polyoxyalkylene (Poa) ether functional group. "A reference may be said to teach away when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the applicant." *In re Gurley*, 27 F3d 551, 553, 31 USPQ2d 1130, 1131. (Fed. Cir. 1994) One of ordinary skill in the art upon reading Okada would not be motivated to use a POS with a polyoxyalkylene (Poa) ether functional group because Okada indicates that the use of such a group is detrimental to the desired product due to decrease in ionic conductivity.

One of ordinary skill in the art would recognize that the ionic conductivity of the compositions disclosed in Okada cannot be compared with those of the instant invention because the compositions disclosed in the example in Okada were doped with tetrahydrofuran (THF), which is well known to be an organic electrolyte permitting an increase in ionic conductivity, as disclosed in paragraph [0070].

The Office Action maintains that the claims are obvious because the SiH groups of constituent A and the alkenyl groups of constituent (B) are substitutable for each other and would yield the predictable results of cross-linkable polymers that would, upon cross-linking, yield the same polymer. Assuming for purposes of analysis only that constituents A and B are both

polyorganosiloxanes (it was shown above that constituent B is not taught to be a polyorganosiloxane), then constituents B and A of Okada would correspond to compounds A and B, respectively, of the instant claims.

Compound A of the instant claims requires at least one group directly bonded to a silicon atom comprising a polyoxyalkylene (Poa) ether functional group.

Okada teaches that constituent B, which corresponds to compound A of the instant claims, has to be "essentially free of any polyethylene oxide structure, in particular any polyalkyleneoxide" in order for the product to have the desired properties. Therefore Okada teaches away from the mere substitution of the two groups, as suggested by the Office Action. Under the rationale proposed in the Office Action, the claims of the instant invention are not obvious over Okada since a non-operable product would result.

To establish a *prima facie* case of obviousness, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. There is no suggestion or motivation in Okada to modify the reference to obtain the method of the present invention. There is no suggestion or motivation in Okada for components A and B to both be polyorganosiloxanes. As indicated above, Okada teaches that component B is reacted with component A to provide a 3D structure. It was shown above that Okada teaches that the nature of component B is such that simple molecules rather than complex molecules such as polyorganosiloxanes should be used to have the desired ionic conductivity and mechanical properties. There is also no suggestion or motivation in Okada to use a polyorganosiloxane having at least one group directly

bonded to a silicon atom comprising a polyoxyalkylene (Poa) ether functional group. As shown above, Okada teaches away from the use of such a group by showing that the presence of such a group negatively impacts the ionic conductivity of the final product. Therefore, there is no suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify Okada to obtain the applicants' invention.

To establish a *prima facie* case of obviousness, there must be a reasonable expectation of success. There cannot be a reasonable expectation of success in developing the claimed composition when the instant claims require A POS having at least one group directly bonded to a silicon atom comprising a polyoxyalkylene (Poa) ether functional group. Okada teaches that constituent B is substantially free of any polyethylene oxide structure, in particular any polyalkyleneoxide, because the presence of the structure decreases the ionic conductivity. One of ordinary skill in the art would recognize that given the teachings that a polyethylene oxide structure, in particular any polyalkyleneoxide, would be detrimental to the ionic conductivity properties of the final product. There also cannot be a reasonable expectation of success in obtaining the claimed composition when the required elements of the composition recited in the instant claims are located in different compounds than those in Okada, and Okada teaches against the use of an element required in the instant claims. In addition, there cannot be a reasonable expectation of success in developing the claimed composition when the instant claims require that components A and B are both required to be polyorganosiloxanes, but Okada only discloses that one of the compounds is a polysiloxane. Therefore there is no reasonable

expectation of success in producing the applicants' invention based on the teachings in the Okada.

To establish a *prima facie* case of obviousness, the prior art reference must teach or suggest all the claim limitations. The Office Action acknowledges that "Okada does not expressly disclose the SiH groups on the (B) compound or the alkenyl groups of the (A) compound as claimed (instead disclosing the opposite)." (page 4, lines 9-10). As shown above, the Office Action also does not teach or suggest that compound (B) is a polyorganosiloxane. Therefore the cited prior art does not teach or suggest all the claim limitations.

Applicants respectfully submit that claims 1-24 are not obvious over Okada. Applicants therefore request the withdrawal of the rejection of these claims under 35 U.S.C. §103(a).

From the foregoing, Applicants earnestly solicit further and favorable action in the form of a Notice of Allowance.

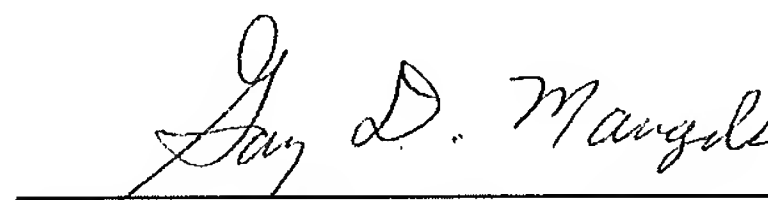
If there are any questions concerning this paper or the application in general, Applicants invite the Examiner to telephone the undersigned at the Examiner's earliest convenience.

Respectfully submitted,

BUCHANAN INGERSOLL & ROONEY PC

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